REMARKS

Claims 1, 4-18, 33, 34, and 35 are pending in the application. Claim 1 has been amended and claim 35 has been added.

As outlined in further detail below, these claims are believed to be allowable for at least the following reasons: (1) The prior art does not show the plurality of independent sensing elements, (2) the cited references, either alone or in combination, do not teach independent sensing elements on a solid substrate with connections extending through the substrate, and (3) the cited references are not properly combined to teach the claimed invention.

Claim 1 as amended also recites the thermal conductivity of the sensor body and requires the sensor body to include a continuous solid material below the plurality of sensing elements, thus providing for a more robust sensor die. These claims are believed to be allowable for the additional reason that these limitations are not taught by the cited references, either alone or in combination.

35 U.S.C. § 102 REJECTIONS

A. Claims 1, 4, 7, 10, and 13-16

Claims 1, 4, 7, 10, and 13-16 have been rejected under 35 U.S.C. § 102(b) as being anticipated by *Bertram et al.* (U.S. Patent 4,085,398). An examination of the teaching in *Bertram* reveals that the claimed invention is not anticipated. Consequently this rejection is inappropriate.

The present invention generally provides for a physical property sensor, including the following elements (with element labels added for ease in identifying the recited elements):

(a) a substantially solid insulating sensor body having a front surface and a back surface, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;
(b) a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater; and
(c) a connection material filling the plurality of openings such that the plurality of independent sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

Because not every element of every claim is taught by the reference, Examiner's § 102 rejections are unsupported by the art and should be withdrawn.

Element (b) of independent claim 1 requires a plurality of independent sensing elements, including a heater and a thermal sensor. As discussed in the present application, these independent sensing elements are critical to the operation of the device. Conversely, *Bertram* describes a resistance temperature detector, or "resistance thermometer," and provides for a substrate with two lead wires configured through two holes through the substrate. *Bertram* does not disclose a "plurality of independent sensing elements...including at least one thermal sensor and at least one heater," as claimed. Rather, *Bertram* only describes a single resistive film.

In order to achieve a designed resistance profile, several patterns are used, including a grid. *See*, Bertram, Col. 2, lines 41-44. In the November 19, 2002 Office Action, the Examiner asserts that "The ladder or grid at Fig. 3 [of *Bertram*] is deemed a plurality of parallel and/or series resistive sensing elements by way of the resistive grid or ladder of platinum" and "each portion of the grid is a sensor...Each portion is also a heater, since a resistor is a heater."

Applicant respectfully disagrees with this interpretation of *Bertram*. The resistive film of *Bertram* is passive and only measures the heat of other objects. Nothing suggests the creation or use of an independent element to provide heat. Perhaps more importantly, the various parts of the *Bertram* grid are not independent. The grid pattern is totally connected and is specifically configured to provide the proper resistance, not for heating. *See* Col. 2, lines 41-44.

For at least the reasons stated above, *Bertram* clearly does not show "every element" of claims 1, 4, 7, 10, and 13-16. Accordingly, Applicant respectfully requests that the Examiner's § 102 rejection as to these claims be withdrawn.

B. Claims 1, 4, 5, 8, and 14

Claims 1, 4, 5, 8, and 14 have been rejected under 35 U.S.C. § 102(b) as being anticipated by *Strott et al.* (U.S. Patent 5,057,811). Because not every element of every claim (as amended) is taught by the reference, the Examiner's § 102 rejections are unsupported by the art and should be withdrawn.

As explained herein, Element (b) of independent claim 1 requires a plurality of independent sensing elements for monitoring the properties of a fluid, including a heater and a thermal sensor. *Strott* does not teach these elements and does not describe monitoring fluid properties.

Initially, *Strott* describes a temperature switch for use in power controllers to protect against thermal buildup in a power system. More importantly, *Strott* does not deal with physical property sensing. The device described in *Strott* includes an insulating layer 4 and electrically coupled thermistors 3, 12, 13 on the insulating layer. *See* column 4, line 23—column 5, line 6. By running a current through a nearby shunt 5, one of the thermistors 3 is heated up relative to the other thermistors 12, 13. Measuring the temperature/resistance difference between thermistors allows for monitoring thermal buildup and determining when a predetermined level is exceeded. *See* column 5, lines 6-31; Figures 1 and 2. In contrast to the present claimed invention, *Strott* only provides for a binary temperature switch, where the switch determines whether a temperature differential is either greater than or less than a predetermined level.

Further, though *Strott* involves the heating of thermistors, Strott does not disclose a heater as set forth in claim 1. *Strott* also does not teach a plurality of sensing elements for monitoring fluid properties as set forth in claim 1. Rather, *Strott* teaches the use of thermistors for measuring the temperature of the shunt 5.

Nowhere does *Strott* describe a plurality of sensing elements, including a heater, for monitoring the properties of a fluid. For at least the reasons stated above, *Strott* clearly does not show each and every element of claims 1, 4, 5, 8, and 14. Accordingly, Applicants respectfully request that the Examiner's § 102 rejection as to these claims be withdrawn.

35 U.S.C. § 103 Rejections

A. Claims 1, 4-16, and 33-34

Claims 1, 4-16, and 33-34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* in view of *Morimasa et al.* (U.S. Patent 5,804,720). The cited references, either alone or in combination, do not teach independent sensing elements on a solid substrate with connections extending through the substrate, and the references are not properly combined to teach the claimed invention. Therefore, this rejection is inappropriate.

References Do Not Teach Each and Every Element

These references, alone or in combination, do not teach each and every element of the claimed invention as required by MPEP §2143. As shown in the discussion of the 35 U.S.C. §102 rejection above, *Bertram* does not disclose a plurality of independent sensing elements, let

alone an independent element for providing heat. Moreover, neither *Bertram*, *Morimasa*, nor the combination thereof teach independent sensing elements on a solid substrate with connections extending through the substrate and attaching to the sensing elements.

Therefore, because dependent claims 4-16 and 33-34 include all of the limitations of claim 1, the cited references also do not teach or suggest all of the claim limitations of claims 4-16, and 33-34. Accordingly, a *prima facie* case of obviousness has not been established as to claims 1, 4-16, and 33-34, and Applicants respectfully request that Examiner's §103 rejections as to these claims be withdrawn.

No Motivation to Combine References

Further, there is no motivation or suggestion to combine these references. MPEP §2143.01 provides: "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990)."

While both *Bertram* and *Morimasa* may be broadly categorized as thin film sensors, there is no specific rationale or objective evidence of record to combine these references as is required by the Federal Circuit. *See In Re Lee*, 61 U.S.P.Q.2d 1430. *Bertram* is exclusively a temperature sensor, which actually has only one resistive sensor and no heater. Further, *Bertram* does not describe relative temperature measurement or detect temperature changes, but only measures the temperature at the resistive film layer of its sensor.

Reading *Bertram* as a whole, it is clear that the reference is concerned with connecting wires of different gauges. This would actually teach away from combining *Bertram* with *Morimasa*.

The *Morimasa* reference, in contrast, is concerned with providing a more durable flow sensor. Moreover, the teachings of *Morimasa* do not resolve the problems disclosed in the prior art that are addressed by the present claimed invention. These problems include the hollow 4 beneath the sensing elements 8, 9, 10 and the connections to the heater 8 and sensors 9, 10.

First, the hollow 4 in *Morimasa* creates turbulence in the gas or liquid flow passing across the sensing elements 8, 9, and 10. The problem of this turbulence, which would adversely affect the accuracy of the flow sensor, has been addressed by the present invention by providing

for a substantially solid sensor die with sensing elements coupled directly to the front surface thereof.

Second, the manner in which the sensing elements 8, 9, 10 in *Morimasa* are formed on the support portion 7 of the bridge structure requires wire bonding. Such wire bonds are susceptible to retaining liquid condensates and other particles suspended in the fluid being measured. Additionally, wire bonds increase the undesirable turbulence and shift flow response. Finally, the hollow 4 described in the *Morimasa* reference would not be readily combinable, without additional teachings, with the plugs 4 of *Betram*, which extend a predetermined length and would reach into the hollow.

To say both references are both in the same field of endeavor because they are "thin film resistive temperature detectors" is misleading. Merely because both references are sensors and include "films" does not put them in the same field of endeavor. Looking at each reference as a whole as previously described, they are quite different as illustrated herein.

B. Claims 17 and 18

Claims 17 and 18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram*, or *Bertram* with *Morimasa*, in view of *Gerblinger et al.* (U.S. Patent 5,430,428). Applicants respectfully oppose these rejections. Because the cited references alone or in combination fail to teach or suggest all of the claim limitations as required by MPEP §2143, Applicants respectfully request that the Examiner's §103 rejection as to claims 17 and 18 be withdrawn.

Neither the *Bertram* nor *Gerblinger* references teach a plurality of independent sensing elements, including a heater, as claimed in the present invention. With respect to *Bertram* with *Morimasa*, as shown above the combination of these references fails to teach or suggest independent sensing elements on a solid substrate with connections extending through the substrate and attaching to the sensing elements. Therefore, combining *Bertram* and *Morimasa* with *Gerblinger* also fails to teach this limitation. Accordingly, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claims 17 and 18.

C. Claim 11, 12, and 34

Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram*, or *Bertram* with *Morimasa*, further in view of *Kushida et al.* (U.S. Patent 4,400,684). Applicants respectfully oppose this rejection. Because the cited references alone or in combination fail to teach or suggest all of the claim limitations as required by MPEP §2143, Applicants respectfully request that the Examiner's §103 rejection as to claims 11, 12, and 34 be withdrawn.

Neither the *Bertram* nor *Kushida* references teach a plurality of independent sensing elements including a heater as claimed in the present invention. With respect to *Bertram* with *Morimasa*, as shown above the combination of these references fails to teach or suggest independent sensing elements on a solid substrate with connections extending through the substrate and attaching to the sensing elements. Therefore, combining *Bertram* and *Morimasa* with *Kushida* also fails to teach this limitation. Accordingly, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claims 11, 12, and 34.

35 U.S.C. § 112 REJECTIONS

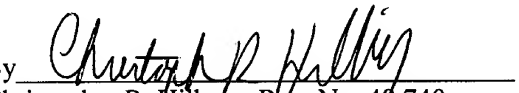
Claim 12 has been rejected under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Specifically, the Examiner objected to the term FOTURAN, asserting that "it is not clear what the claimed material is, as a trademark typically designates a source of goods, not a material."

The mark description says FOTURAN is "perforated screens made of glass or glass ceramic...," which clearly denotes a material.

CONCLUSION

Applicants submit that all pending claims are allowable and respectfully request that a Notice of Allowance be issued in this case. Attached hereto as "Pending Claims," for the Examiner's convenience, are all the claims as pending. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at 612-607-7387. It is believed that no fees are due in connection with the filing of this paper, however the Commissioner is authorized to charge any deficiencies or credit any overpayments, including fees for any extension of time, to Deposit Account No. 50-1901 (Reference 9028-322).

Respectfully submitted,

By 

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IN THE CLAIMS

Please amend claim 1 as follows:

1. A physical property sensor die, comprising:

a substantially solid insulating sensor body having a front surface and a back surface, and the sensor body having a known thermal conductivity, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;

a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater, wherein the thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of independent sensing elements via the sensor body, and wherein the sensor body includes continuous solid material below the plurality of sensing elements thus providing for a more robust sensor die; and

a connection material filling the plurality of openings such that the plurality of independent sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

Please add claim 35 as follows:

35. The physical property sensor die of claim 1 wherein the sensor body and the connection material have a substantially similar coefficient of thermal expansion.

PENDING CLAIMS
SERIAL NO. 09/656,694

1. A physical property sensor die, comprising:

a substantially solid insulating sensor body having a front surface and a back surface, and the sensor body having a known thermal conductivity, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;

a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater, wherein the thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of independent sensing elements via the sensor body, and wherein the sensor body includes continuous solid material below the plurality of sensing elements thus providing for a more robust sensor die; and

a connection material filling the plurality of openings such that the plurality of independent sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

4. The physical property sensor die of claim 1 wherein the plurality of sensing elements include an environmental sensor.

5. The physical property sensor die of claim 1 wherein the plurality of sensing elements include at least a second thermal sensor.

6. The physical property sensor die of claim 1 wherein the sensor body is made up of a photosensitive glass.

7. The physical property sensor die of claim 1 wherein the sensor body is made up of a ceramic.

8. The physical property sensor die of claim 1 wherein the sensor body is made up of a highly melting glass.

9. The physical property sensor of claim 1 wherein the sensor body is highly insulating silicon.

10. The physical property sensor die of claim 7 wherein the ceramic is alumina.

11. The physical property sensor die of claim 8 wherein the ceramic is highly melting glass is fused silica.

12. The physical property sensor die of claim 6 wherein the photosensitive glass is FOTURAN.

13. The physical property sensor die of claim 1 wherein the plurality of sensing elements are constructed of platinum coated on the front surface.

14. The physical property sensor die of claim 1 wherein the substantially solid sensor body is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements.

15. The physical property sensor die of claim 1 wherein the substantially solid sensor body includes a plug made of a first material positioned below the plurality of sensing elements, the plug being surrounded by a second material which makes up the remainder of the substantially solid sensor body.

16. The physical property sensor die of claim 15 wherein the plug is substantially cylindrical.

17. The physical property sensor die of claim 14 wherein the first material is glass and the second material is alumina.

18. The physical property sensor die of claim 15 wherein the first material is glass and the second material is alumina.

33. The physical property sensor of claim 1 wherein the sensor body has a low thermal conductivity.

34. The physical property sensor of claim 1 wherein the sensor body is made up of PYREX.

35. The physical property sensor die of claim 1 wherein the sensor body and the connection material have a substantially similar coefficient of thermal expansion.